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# U. S. DEPARTMENT OF AGRICULTURE

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## COMMUNITY COTTON PRODUCTION



**C**OMMUNITY PRODUCTION of cotton is the growing of only one variety in each community or district.

An adequate supply of pure planting seed of standard cotton varieties is the fundamental requirement of the American cotton industry, to replace the mixed "gin-run" stocks now generally grown. A general investigation of the breeding and utilization of superior varieties of cotton has shown that pure seed can be produced only in communities that limit themselves to one variety. Under this system the mixing of seed and the consequent running out of varieties are avoided, production is based on pure seed, superior varieties are utilized, better cultural methods are adopted, greater efficiency in production is secured, and commercial advantages are obtained from the marketing of a uniform product.

This bulletin outlines the one-variety community method of cotton production, including the selection of a variety, the maintenance of seed stocks, and the organization of new centers of pure-seed supply.

# COMMUNITY COTTON PRODUCTION.

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## THE NEED OF SUPPLIES OF PURE SEED.

**S**TUDY of the problems of cotton production in America has shown that many improvements are possible in this industry, but the fundamental need is a change in the basis of production from the planting of mixed "gin-run" seed to the planting of uniform, select varieties. Since progressive efforts logically begin with pure seed, less interest can be expected in other improvements until pure seed is available in sufficient quantities for general use. The present system of production is based on inferior seed stocks and is wasteful in many ways. Instead of superior varieties being planted and the best methods utilized, most of the planting seed is of ordinary gin-run quality, and much of the crop is grown and handled carelessly, resulting in small yields and low commercial value.

The commercial seed stocks are inferior largely because production is unorganized. Different varieties are grown in the same communities, the seed is mixed at the public gins, crossing takes place in the fields, and the stocks run out. Even if the best stocks are introduced they are completely mongrelized in a few seasons, which offers no prospect of wide utilization of superior varieties under the usual conditions. Thus the problems of utilizing varieties had to be studied as well as the breeding of varieties, and the investigation led finally to the one-variety plan. By the simple expedient of planting only one variety of cotton in a community, it is possible to eliminate the chief causes of deterioration of seed stocks and at the same time to open the way to many other improvements. Organized communities of cotton growers can utilize to the

greatest advantage the superior varieties of cotton that have been bred or acclimatized from foreign countries and the more effective cultural methods that have been devised for boll-weevil conditions.

Advantages of standardized production, with a single superior variety grown by whole communities or districts, are being recognized with many crops; but in the cotton industry such standardizing has a special purpose, as a means of providing pure seed. The only prospect of maintaining adequate supplies of pure seed is to be found in a community that limits itself to the growing of one variety of cotton, so that there is no mixing of seed at public gins or crossing of different varieties in the fields. The seed stocks then are not mongrelized, and the variety can be kept pure and uniform from one year to another. Also, the production of uniform fiber becomes possible in commercial quantities that can be marketed at better prices than the uneven product of mixed-variety communities. Production is thus standardized in a practical way by adopting and holding to one variety in each community.

Though it has not been customary in the past to consider community conditions in the study of production, a broader view of production is now recognized, which includes all of the factors that determine the farmer's success or failure with cotton or other crops. Obviously, a crop that is too unprofitable or too uncertain will not continue to be planted. Prices need to be stabilized, and the best prospect of accomplishing this may be through standardized production. From this standpoint the advantages of one-variety cotton communities deserve careful consideration. Community production may be considered a new system, in view of the many improvements that become practicable as a result of holding to one variety.

Although the individual farmer in an organized community still plants, cultivates, and picks his own crop as before, the conditions of production are improved fundamentally when all the farmers of a community are ready to unite upon one variety and to use the same cultural methods. The same labor can be made to yield a larger and more valuable product to each of the farmers of an organized community, because production is on a higher plane of quality, both of seed and of fiber. It is not possible for individual farmers to get the full advantage unless improved varieties and methods are used by whole communities. The community conditions, which largely determine the possibilities of individual improvement, are to be recognized as of the same practical importance as good seed, good tools, or good methods used in growing the crop.

Farmers are being urged to cooperate in marketing and for many other general objects, but community production may be urged as the first step in market improvement, since it is undoubtedly much easier to secure good prices for an improved and standardized crop. With cotton the yields may be increased as well as the prices by community cooperation, through better seed, improved cultural methods, and more effective control of the boll weevil. Thus it is found that many of the strictly agricultural questions regarding the best varieties to grow, the time of planting, and the treatment of the crop in the field are to be answered in the most practical way by community production of one variety under uniform methods.

**IMPORTANCE OF UNIFORMITY IN COTTON.**

On account of the industrial use of the fiber, the practical need of uniformity is greater with cotton than with other crops that are being more carefully standardized. Fiber that is not uniform does not spin well or make strong, durable fabrics. Improved spinning machinery has made it possible to spin finer fabrics with shorter staples than could be used formerly, but the fiber must be uniform or the machinery does not work properly. More labor is required to spin and weave with irregular fiber because the threads break more frequently.

There is no real advantage or practical reason to justify growing the irregular short fiber that forms the bulk of the American cotton crop. The failure to utilize good varieties results in needless waste, since the labor and other costs of producing inferior short staples are the same as for cotton of better quality that might be grown in much larger quantities. It seems not improbable that the value for textile purposes of most of the cotton grown in the United States could be at least doubled by using superior varieties and keeping the seed pure, so that the fiber would be uniform. However, general utilization of good varieties is not possible without adequate supplies of pure seed, and these are not maintained under the present system of production.

It is a general belief among buyers and manufacturers of long experience that a serious deterioration in the quality of American Upland cotton has occurred in the last half century. An explanation of this may be found in the development during the same period of the system of public gins which gradually replaced the private plantation gins. The general mixing of the seed of different varieties together at the public gins would undoubtedly explain such a deterioration of the product as is supposed to have taken place. It is known that many of the older planters maintained select stocks of seed, but the individual farmer can not do this under the modern system of public gins.

Even if the varieties could be kept apart and marketed separately, the growing of many kinds in a community would cause useless labor and difficulty. From the standpoint of industrial efficiency it would not be more wasteful or absurd if each operative in a cotton mill were to spin a different count of yarn or to weave a different fabric than to produce the fiber by the present system, with neighboring farmers growing different kinds of cotton or mixtures of different kinds, so that the product necessarily is uneven. It must seem very strange to the manufacturers that such a quality as uniformity, which is of prime industrial importance, should be so completely disregarded in the system of production. Such, however, is the effect of the present unorganized conditions under which each farmer produces independently.

In order to improve production, the return to the farmer must be increased by larger yields of more uniform fiber that can be sold at better prices. To meet these requirements the seed must be pure, and adequate supplies of pure seed of standard varieties must be maintained from year to year. If the seed stocks are not uniform, the plants are not uniform in the fields, and the fiber that comes from the different plants is not uniform in the bales. So much of the cot-

ton at present is lacking in uniformity that the manufacturers accept this as a normal condition and overlook the fact that the production of more uniform fiber is possible.

The commercial world also fails to recognize differences of quality in small lots of cotton. The individual farmer has little incentive to improvement of quality under the present system because cotton generally is bought at "flat" prices. The farmer who produces better cotton gets no advantage, the buyer taking the profit of the good bales as the return for his services in sorting or "classing" the mixed and irregular product into the so-called "even-running lots" which are required for commercial and industrial purposes. Bales of 500 pounds are reckoned as the commercial units of the cotton industry, but the industrial units are much larger. Manufacturers are interested in securing hundreds or thousands of bales of the same kind of cotton. Since uniformity of the fiber is essential to good results with machine spinning, the grading and classing of the cotton is an important feature in the handling of the crop as it passes from the farmer to the manufacturer, though the results are only approximate. The diversity is reduced by classing, but the full possibilities of uniformity are not attained. Commercial classing of the bales does not make them more uniform, but only brings together the bales from which similar samples happened to be drawn. The cotton is supposed to be uniform unless differences are shown between two samples that usually are drawn from each bale, but badly mixed bales often "get by" and make trouble at the mills.

Thus the present system is not only very wasteful of human effort and resources of production but also seriously restricts progress and improvement, since it generally denies to farmers the legitimate advantage that should come from planting better varieties of cotton and using improved methods of cultivation. Improvement of the quality and uniformity of the American cotton crop affords the best prospect of maintaining good prices. A general adoption of the one-variety plan would place the cotton industry in a better relation to foreign competition, as well as supplying American manufacturers with superior raw materials.

### MAGNITUDE OF THE PURE-SEED REQUIREMENT.

The quantity of pure cottonseed now available is an extremely small fraction of what is required for planting purposes. Approximately 500,000 tons of seed are needed every year to plant the cotton acreage of the United States, and of this quantity it has been estimated that only 30 per cent is supplied through commercial channels, while 70 per cent is raised on the farms where used.<sup>1</sup>

It is well known that much of the commercial seed is not pure, but of ordinary gin-run quality, often no better than the seed that the farmer would get from the local public gin. Thus it can be seen that the lack of pure seed is general and is responsible for enormous industrial and economic wastes through the production of inferior fiber and the manufacture of weak and perishable fabrics.

The underlying cause of this chronic deficiency is the general condition of unorganized production, with different varieties of cotton

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<sup>1</sup> Barr, J. E. Marketing cotton seed for planting purposes. U. S. Dept. Agr. Bul. 1056, 24 p., 7 fig. 1922.

planted in neighboring fields and taken to the same gins, so that it is out of the question to keep the seed pure. The gins mix the different kinds of seed, crossing takes place in the fields, and the varieties are mongrelized and cease to be uniform. The fiber deteriorates in quality as the mixing of seed goes on, and the yields gradually decline because many of the plants are sterile or the seeds are only sparsely covered with lint, which farmers take as a sign that the stock has "run out."

For commercial purposes it is often considered sufficient to order seed from a district where a good variety is known, with no precaution to insure the quality of the particular seed that is purchased. The seed received may not represent the variety that was ordered or may carry a mixture of other varieties. With most varieties the running-out process begins as soon as the stage of commercial production is reached. Even when first distributed, most of the commercially advertised stocks are not uniform, and usually there is no provision for maintaining the stocks after the first few years in which a variety can be advertised and sold at high prices as a novelty.

But a distinct improvement in such matters has been noted in recent years as a result of greater interest in pure seed. More seed is being sold by breeders or by large growers of one variety than by dealers who handle stocks of different varieties. Also the dealers who are anxious to furnish pure seed are taking the precaution to secure their stocks from communities that grow one variety. In some cases progressive seed firms have secured the organization of pure-seed communities and provided facilities for clean ginning in a separate establishment strictly confined to one variety. No doubt the time will come when seed for planting purposes will be obtained only from gins that handle one variety of cotton.

### MIXING OF SEED AT PUBLIC GINS.

The need of ginning, to separate the fiber from the seed, is a feature of the cotton industry that gives rise to special problems in relation to the supplies of seed. Cotton gins are like gristmills in having no provision for keeping separate any farmer's seed. All of the seed cotton as it comes from the fields must be passed through the gins before the crop can be marketed or seed secured for planting. The extent of seed mixing at cotton gins has increased gradually with the development of the system of public gins to replace the old plantation system of private gins. A modern gin equipment gives each farmer several bushels of the mixed seed held over in the gin rolls from the previous customer.

Methods of determining the extent of mixture have been devised, and experiments with a modern gin plant have shown that more than 25 per cent of mixture may result in the seed of the first bale that follows a different kind of cotton.<sup>2</sup> With second and third bales smaller percentage of mixture occur, and mixture may continue even to the ginning of the fourth bale and beyond if the seed is not sacked under the gin stand but is allowed to go through the screw conveyor.

<sup>2</sup> Ballard, W. W., and Doyle, C. B. Cotton-seed mixing increased by modern gin equipment. U. S. Dept. Agr. Cir. 205, 12 p., 1 pl. 1922.



Though it is possible to avoid mixture by thoroughly cleaning the gin stands and not using the conveyors, these precautions are seldom observed at regular public gins, not only on account of the labor and expense of doing the work but because too much time would be lost and customers driven away from a gin if any attempt were made to keep each customer's seed separate. The title-page illustration shows farmers waiting at a public gin. Wagons that follow each other at the gin may bring different kinds of cotton, or a farmer who plants good seed may follow one whose load was grown from seed of ordinary gin-run quality.

No doubt it would be possible to devise other forms of equipment that would be easier to clean, so that the extent of mixing could be reduced, but to develop such improvements and establish them in general use might be as difficult as to organize production on a one-variety basis, to say nothing of the expense of replacing or altering the equipment. Hence it appears that the organization of one-variety communities is a simpler, cheaper, and more effective way to avoid the mixing of seed at gins, in addition to the other advantages of community production.

### CAUSES OF "RUNNING OUT" OF COTTON VARIETIES.

Though the mixing of seed at gins is undoubtedly the chief cause of the rapid "running out" of cotton varieties, it is not the only cause. The flowers of the cotton plants are open-pollinated and are readily cross-fertilized by insects. Although cotton pollen is not blown by the wind, because the grains are sticky and adherent, bees or other insects visit the flowers and carry the pollen for considerable distances, so that varieties growing in neighboring fields may be extensively cross-pollinated, in addition to the general crossing of plants in the same field where mixed seed is planted. The amount of crossing depends, of course, upon the number and activity of the insects, which vary with the locality and the season; but the idea formerly entertained that cotton is not cross-pollinated or that crossing is too infrequent to be of practical importance in maintaining seed supplies has proved erroneous.

The degeneration that results from the crossing of different varieties in the field and the mixture of seed at the public gins is no doubt the basis of the popular idea that cotton varieties soon "run out" and that "fresh seed" must be brought from other districts. The supposed remedy, "changing the seed," does not remove the cause of degeneration, but only invites more "running out." The more numerous the varieties represented in a community, the greater the mixing of the seed at gins and crossing in the fields. Instead of changing the seed, the methods of obtaining the seed supply need to be changed, so that varieties can be preserved and kept uniform instead of being mixed and allowed to deteriorate. No matter how good the original varieties may have been, a mixed stock becomes in a few generations thoroughly miscellaneous and mongrelized, with many abnormal and infertile plants, very inferior to either of the parental types.

It is customary in some districts for ginnermen or oil-mill managers to bring in carload lots of fresh seed every two or three years to sell to the local farmers. To increase the sales farmers are assured that

frequent change of seed is necessary, which undoubtedly tends to give currency to a mistaken idea. In reality, pure varieties of cotton do not spontaneously degenerate, or run out, and when properly isolated from other varieties and selected under local conditions they may be kept pure and uniform for indefinite periods. For example, the well-known Triumph cotton, bred by the late Alexander Mebane, at Lockhart, Tex., has been maintained in uniform condition for about 30 years. A process of selective breeding must be continued with cotton varieties, as with the breeds of farm animals, if high standards of quality and uniformity are to be maintained in any variety. This branch of breeding work is quite as important as originating new varieties, or even more important, since the production values of varieties are not to be realized unless the seed stocks are maintained.

The yields, of course, are reduced as well as the quality of the fiber by planting mixed or inferior seed. As a result of crossing there are many hybrid plants which are very inferior, even to the extent of being completely sterile, or are so late in maturing that the bolls do not open before frost, if any escape the weevils. Also, the fiber produced by off-type plants is likely to be very short or sparse, as on the well-known "slick-seeded" plants that often appear in run-out stocks. It was through the study of such facts that the need of one-variety communities was recognized as the only means of developing and maintaining larger supplies of pure seed.

### **SAVING IN COSTS OF PURE SEED.**

In addition to maintaining and utilizing superior varieties, many other advantages are to be secured through community production. Even if good seed could be had in sufficient quantities from other sources, home production is an advantage to any community because it provides seed at the lowest cost. This factor alone would be a sufficient reason for taking the precautions recommended, since large sums of money are often spent for seed brought from one district to another, much of it of the ordinary gin-run quality. In addition to supplying themselves with seed, the farmers of a one-variety community are in the best position to sell seed in other districts that do not have pure seed of their own. The first communities to organize in any State or region will have, of course, the best chance to sell seed to other communities or to furnish seed in wholesale quantities to dealers. Without doubt, reliable dealers will buy their stocks of seed from one-variety communities as soon as there is sufficient volume of production of pure seed to meet the commercial demand.

### **COMMERCIAL ADVANTAGES OF A UNIFORM PRODUCT.**

The marketing advantages also would be a sufficient reason for urging that communities should grow only one variety of cotton, not only because better cotton can be grown but also because better prices can be secured for large quantities of fiber of one uniform quality than for cotton of different kinds or smaller quantities. Having a standardized "unit" product to offer, the labor and expense of classing the bales are reduced, which may be a considerable saving, while at the same time the fiber is of actually greater textile value.

Practical demonstrations have been given by the Bureau of Agricultural Economics of the advantages of community cooperation in marketing through bringing together larger quantities of cotton. Communities have been organized in several States for cooperative marketing, and assistance is given by agents of the Bureau of Agricultural Economics in grading and classing the cotton, which furnishes a basis for more direct dealings with responsible local buyers or with outside purchasers. This tends to stimulate competition, and it has been shown that buyers will come long distances if sufficiently large stocks of cotton are offered. Moreover, the chance of securing a large lot of one superior kind of cotton is more of an attraction to an outside buyer than the same number of bales made up of different varieties or raised from mixed gin-run seed.<sup>3</sup>

### GREATER EFFICIENCY IN PRODUCTION.

The increased value or saving that would be possible in the American cotton industry if approved methods and varieties were generally used would reach an enormous total, though figured on a most conservative basis. Replacement of the present inferior mixed stocks by superior uniform varieties undoubtedly would give a direct gain of at least 10 per cent in quality and as much more in yield. Another 10 per cent increment might be expected through the cultural improvements that become more feasible in one-variety communities. Advantages from community handling and marketing of a standardized product would not be less important than the other items, and the sale of pure seed is a further resource of one-variety communities. Thus it may be considered that our present unorganized production of cotton may have only 50 per cent efficiency if measured in returns or profits for the farmer and compared with what might be found possible if improved varieties and methods were regularly used in organized one-variety communities.

### CULTURAL IMPROVEMENTS IN ORGANIZED COMMUNITIES.

In weevil-infested regions it is especially important that all the farmers of a community grow the same variety and use the same methods of handling the crop and controlling the weevils, such methods being much more effective if they are applied by the whole community than by scattered individual farmers. The date of planting the cotton is one of the questions that should be considered from the standpoint of the community, instead of each farmer trying to plant earlier than his neighbors in the belief that this is the best way to avoid weevil injury. The dangers of very early planting are that the labor and seed may be lost if the weather is too cold and that weevils bred on very early cotton will do increased damage that can be avoided by simultaneous planting.

Cultural methods need also to be as uniform as possible in a community, so that the crop may be in the same general condition

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<sup>3</sup> See *The Commercial Classification of American Cotton with Reference to the Standards for Grade, Color, and Staple*, by Arthur W. Palmer, U. S. Dept. of Agr. Cir. 278, January, 1924.

when poisoning or other measures of controlling the weevils are applied. To secure a regular maturity of the crop is also important, so that the fields can be cleared at an early date in the fall to reduce as far as possible the number of weevils that can survive the winter. Control of the size of the plants by closer spacing in the rows is a means of inducing earlier production of the crop, so that earlier picking and clearing of the fields are made possible. But the full advantage is not gained if some of the farmers space their cotton wide apart and grow large plants that produce late bolls not opening before frost.

With only one variety grown in a community, interest and emulation develop among the farmers because much more direct comparison of results can be made, which will depend very largely on knowledge and ability to handle the crop in a skillful manner. With one variety the effects of different conditions of soils, seasons, and cultural methods are more clearly recognized, instead of being confused with differences in the characters of several varieties. Thus the farmers gain a more thorough, practical familiarity with the characteristics and behavior of the single type to which their attention is devoted. The more intensive study of the production problems in one-variety communities may also be expected to react favorably in relation to marketing improvements or other constructive measures.

Farmers who have become thoroughly familiar with the plant characters and behavior of one variety are also in position to undertake the careful selective breeding that is necessary if high standards of production are to be maintained. A much greater amount of breeding talent must be developed and exercised in behalf of the cotton-growing public if adequate supplies of good seed are to be regularly available. The farmer who has talent for such work should be recognized by his neighbors in the same way that breeders of special strains of farm animals are recognized, by getting higher prices for stock.

### **ORGANIZATION PROBLEMS OF COMMUNITY PRODUCTION.**

Undoubtedly there is much to be done in working out the forms of organization that are best adapted to the needs of cotton-producing communities. The forms that are needed will depend, of course, upon the functions that the organizations are expected to perform in different communities. Where marketing organizations already exist it will be natural for these to be interested in improvements of production, or it may be considered better to form separate organizations for handling the seed supplies or dealing with the cultural problems.

One stage of progress is reached when the need of community cooperation is recognized, on the basis of the facts that have been determined in relation to breeding superior varieties and maintaining supplies of pure seed. A further stage of progress will be attained when methods of community cooperation have been developed for securing in the simplest and most effective ways the advantages that are in sight through a one-variety system of production.

To study and work out the best methods of establishing and maintaining one-variety cotton communities is like improving new types of farm machinery or perfecting such devices as spray nozzles or dusting machines that have been developed in recent years for protecting crops against insect pests or plant diseases. Not only are many improvements likely to be made, but there is the same need that each improvement be demonstrated in actual practice before it is ready for general adoption. Since one-variety communities are a means for protecting and maintaining seed stocks and securing other advantages to cotton growers, how to adapt the community idea to the local conditions is a problem that should have the same practical consideration as any farm improvement.

Strictly from the production standpoint, it may not be necessary in some communities to have any formal organization if the agreement to plant only one kind of cotton can be made effective by simple understanding, through force of public opinion, or in other ways. The first step in securing community agreement is to get as clearly understood as possible the general facts that determine the need of organization. Until the need of unified community action is recognized, the interest is likely to wander at any time to incidental questions about particular varieties, cultural methods, or other details, possibly of local importance, but having no real relation to the organization problems. Though many communities will find serious difficulties in reaching an agreement to grow only one variety of cotton, some communities are ready for constructive measures if sufficiently informed.

In communities that are not yet united for constructive work it is better to place the first emphasis upon the general advantages of one-variety organization than to insist upon the superiority of a particular kind of cotton. Usually there is not sufficient evidence to prove that a particular variety is the very best that can be had for the local conditions, but differences between the good varieties are much less important than the differences between organized and unorganized communities. In some cases one-variety conditions may be reached by stages of approximation, by discarding gradually the varieties that are considered least desirable; but even with a few varieties it is not easy to keep the seed separate and to avoid crossing in the fields. Choice of varieties is generally limited by the fact that stocks of pure seed are obtainable for only a few kinds. Clubs for cotton improvement might contribute to the solution of the variety problem, along lines that have been followed with corn or with livestock. A study of the cotton-improvement problems might be undertaken by any existing agricultural organization as a preliminary to taking up the question of a community organization.

### NECESSITY OF HOLDING TO ONE VARIETY.

A thorough understanding of the advantages to come from holding to one variety should be considered as the first requirement in organizing a one-variety community. If this idea is not sufficiently established there is danger of casual changing of varieties with resulting confusion and failure. A stabilized community production of the best variety that can be grown under the local conditions is

the program that should be adopted and not sacrificed later to casual interest in untried varieties or to curiosity aroused by vividly advertised novelties.

Continued breeding and testing of new sorts is important, of course, so that no really valuable improvements may be overlooked, but time must be allowed for reliable results to be reached by regular side-by-side comparisons of the more promising varieties. Such observations and experiments need to be repeated for several years in the same localities, to learn the effects of different seasons. Farmers too often choose varieties merely by guessing that one field is better than another. Very few farmers are in position to give the time, attention, and extra labor that are required for making reliable tests of varieties, while casual tests are often costly and misleading. Even with the facilities of experimental stations such testing is a difficult problem. One of the difficulties is that the seed from such test plantings is worthless, on account of the crossing that usually takes place, so that special stocks of seed must be held over or obtained from sources that are definitely known, to be sure that the same stocks are being compared in the different seasons.

There can be no question that injury is done to farmers who have established pure seed supplies of a superior variety of cotton if careless, ignorant, or malicious neighbors insist on planting an inferior variety or mixed stock. This would not only destroy the value of the surrounding fields for pure seed but would impair the quality and reputation of the seed and fiber of the whole community if either this inferior seed cotton or that from adjacent fields were taken to the public gin. A suggestion has been made in Arizona and California that community local-option laws might be passed that would make it possible for the farmers of any locality or district to establish the culture of a single variety and to secure legal protection against the planting of other kinds of cotton, to the detriment of the community. Such recognition of the one-variety communities would not be very different from the present system of organizing irrigation or drainage districts for mutual advantage or protection.

Until the advantages of community production are thoroughly understood, differences of personal opinion about varieties or other questions of relatively minor importance are to be expected, and disagreement should not discourage a practical effort if there is even a small nucleus of active one-variety interest. In such cases changing to one-variety production may require several seasons, in which special precautions must be taken to develop seed stocks for the community and keep the variety from becoming mixed. The community seed stocks must be isolated not only from other plantings but from hold-over plants or from the volunteer plants that often grow from accidentally scattered seed. The gin machinery must also be cleaned carefully and the seed sacked at the gin stand instead of being passed through the screw conveyor. Where these precautions have not been observed, seed stocks should be purchased from other districts where the seed has been kept pure.

## GINS AS COMMUNITY CENTERS.

Segregation of varieties by communities, to be fully and effectively applied, must include gin segregation, so that only one kind of cotton is passed through the gin machinery. When this is accomplished, the mixture of varieties at the gins that occurs under the old system is avoided simply and effectively, and the way is open to a regular maintenance of pure-seed supplies. With the separate ginning and precautions of isolation, careful selection, and roguing of the seed fields, a variety of cotton can be kept pure and uniform for many years.

The problems of organizing and maintaining communities are simplified by recognizing clearly the necessary relation to the gin. Since separate ginning is a practical necessity if any stock of seed is to be kept pure, some arrangement for separate ginning must be included in any plan of community production. The gin-unit community is the practical minimum on which to build a successful co-operative organization to grow one kind of cotton.

Keeping small lots of seed separate and pure in a mixed-variety district, while not impossible for farmers who are sufficiently careful, is more expensive in time and money than buying seed elsewhere. As long as there is constant danger that varieties will be mixed in the fields or at the gins, only the more progressive and persistent farmers are likely to continue the effort that is necessary to keep their seed pure. The establishment of a one-variety gin tends naturally to encourage one-variety conditions in the vicinity.

Large properties that have their own gins and handle their seed stocks carefully may readily establish one-variety conditions of production, or neighboring estates may adopt a one-variety policy and make it effective through ownership or control of a gin. Some landowners include in their agreements with tenants that only an approved variety of cotton is to be planted.

It may be argued that the gins should belong to the farmers in order to assure the full control that is necessary to insure careful ginning and otherwise protect the interests of the farming community, but it also needs to be remembered that control is not all that is necessary for practical success. The gins must be run properly, and this is the practical problem, whatever the ownership or control. Communities may find it very difficult to provide in behalf of the public the same kind of practical interest in the ginning work that is inspired by the investment of private money. It may cost the community more for the overhead management of the gin to assure the same quality of work. But in any event the community has the problem to face of knowing that the ginning is properly done. All of the producers are injured if the value of the cotton is depreciated by bad ginning.

## DEVELOPING COMMUNITY SEED SUPPLIES.

Communities that change to the one-variety basis may organize for the purpose of growing their own planting seed. Some form of community interest or ownership of seed is desirable, since the general community responsibility must be recognized in a definite way,

to make the seed available to all the growers. This responsibility may be assumed by a progressive group of farmers buying a stock of pure seed and increasing it for the community benefit. Or a community organization may buy a small stock of pure seed and arrange with a reliable farmer or several neighboring farmers to increase this seed by growing it under conditions of isolation from any other cotton. Planters handling the pure stocks should be under contract to observe precautions in handling the seed in the field, as well as in ginning, and to sell the seed in the community at an agreed relation to oil-mill prices.

Several ways of keeping a high standard of purity of the community seed are recognized. Communities may hire a competent man to carry on the breeding operations and thus breed up their own stocks of the variety from individual plant progenies, with careful roguing of the increase fields. Another plan would be for the community to buy small quantities of high-class certified seed from reputable plant breeders and increase these stocks for their own field plantings. It must be remembered that to breed cotton efficiently requires special training and experience, as well as natural interest in the study of plant characters. Though people differ greatly in their natural interest and aptitude for such work, it is folly to expect useful results from casual volunteer efforts. Even the trained and practiced breeder needs time to become familiar with a variety that is new to him, before he can do effective, discriminating work.

To operate on a practical and efficient basis through a series of years, a one-variety community should have its own regular supply of planting seed from fields that are reserved for this purpose. These fields should be planted with seed direct from select increase fields that were carefully rogued to remove all of the off-type plants. This plan would call for roguing a sufficient acreage each year to furnish enough seed to plant the entire community the second year. Operating on this plan, a higher standard of uniformity could be maintained in the community than if each farmer selected his own seed. It is not to be expected that many farmers will have the interest or give the attention that is necessary to become proficient in selection or roguing work to maintain a uniform type of cotton.

Communities that have effective ways of maintaining stocks of pure seed may expect the most active demand from other localities. Perhaps the best example of a completely isolated community that is specializing upon a single variety of cotton is in the Coachella Valley of California, where the Acala cotton is being grown. All of the first-class seed produced by this community in 1922 was sold at good prices in other irrigated valleys of southern California and Arizona.

If possible, a new community should bring in the best seed stock of the chosen variety that is obtainable from some district where the variety is grown exclusively and where selection and isolation have been maintained to guard the purity and uniformity of the stock. With the same precautions continued for a few years under the local conditions, the home-grown seed is likely to be found distinctly better than any that can be had from other districts. Experiments show that selection for local adjustment may be needed to render varieties more fully adapted to the local conditions, as indicated by the fact



that larger yields have been secured from locally selected strains than from seed of the same varieties brought from other districts. An increased variability is often shown in stocks that are planted for the first time under new conditions.

### CHOICE OF A COMMUNITY VARIETY.

Interest of some farmers in particular varieties often stands in the way of community agreement, by making it difficult to unite upon a single variety. In many communities there are farmers, ginner, or oil-mill managers who make it a practice to bring in and sell fresh seed of new varieties every year, while in a one-variety community there is no demand for fresh seed unless the community changes as a whole to a better variety. The interest of seed sellers obviously should not keep farmers from agreeing upon one variety and raising pure seed that can be sold to advantage instead of buying outside seed.

Of course it is important to select the best variety for community use; but too much emphasis should not be laid on this idea of having the very best variety, or divergent opinions may keep any general agreement from being reached. Each farmer should consider that the best variety to plant is the variety that other farmers can agree upon, in any community where there is an approach to unanimity. This is the most practical answer to the question of what variety to plant in any community where most of the farmers are growing one variety. Undoubtedly it is much better for a community to be united upon the production of a variety that may not prove to be the most desirable than to have several superior varieties brought in, only to become mixed and mongrelized.

A policy of first narrowing down gradually from several varieties to a few has been followed in some districts as leading eventually to an appreciation of the practical advantages and advisability of planting only one variety. Local variety tests are conducted to enable the farmers of a community to select what they consider the best from a series of promising varieties. Seasonal fluctuations of behavior may be very misleading, so that several years may be required to reach definite results. Of course, the choice of a variety is not absolute, but may be revised in the light of further information and experience. An organized community can change promptly to a better variety when a definite advantage can be shown and pure seed obtained in sufficient quantity.

The greatest care should be taken in securing the primary stock of planting seed of the chosen variety. A thorough investigation should be made of the source of supply, as success may depend to a great extent on the quality of this initial stock. A few of the most essential qualifications for pure planting seed are: (1) Selection of the strain by a reputable cotton breeder, (2) increase of the select stock in fields well isolated from other varieties of cotton, (3) removal of all rogues or off-type plants, and (4) full precautions to assure clean ginning. Every effort should be made to secure seed that can be relied upon, which obviously is difficult except in communities that are specializing and restricting themselves to the particular variety of cotton. The need of pure planting seed is beginning to be appreciated, and no doubt the time is not far distant

when all cotton seed sold for planting purposes will carry some form of definite assurance or certification as to the conditions under which it was grown and the number of years since the stock was rogued. The actual quality of a seed stock can be judged, of course, by the absence of off-type plants in the field.

The first pure-seed communities in each district will naturally expect to profit by selling seed to other communities and thus have the advantage in the early years of community development, while the marketing and other community improvements are being worked out and established. Communities that propose to sell seed will naturally prefer varieties that are well known or have good prospects of general use, as distinguished from those that require special conditions or have been grown in only a few localities. The demand for pure seed is chiefly limited at present by the fact that very little is to be had, so that too many buyers have been disappointed. Pure seed is in demand in carload lots as well as in bushels or tons.

### FACTORS IN JUDGING VARIETIES.

Farmers need to have a more general understanding than at present regarding the features that are of practical importance in developing superior varieties of cotton or in determining the value of existing sorts. Some of the current ideas are erroneous and often interfere with the exercise of good judgment in the choice of a community variety. With many farmers the only feature considered in judging varieties is the percentage of lint or "outturn at the gin." Even the yield per acre is likely to be disregarded, since many farmers do not know the exact size of their fields, so that the gin outturn is the only definite figure that they get. Some of the varieties that in other respects are very inferior show a high percentage of lint, notably in the so-called "Half-and-Half" cotton which farmers have been advised not to plant, the fiber being so short that buyers often refuse to pay the full price.

Another common misapprehension is that varieties with very short staples are necessarily more productive than varieties with longer staples. This belief had some apparent ground in former days when long staples were produced only by late-maturing sorts, so that production averaged much lower than with early-maturing, short-staple varieties. But several very early and prolific Upland varieties are now known that produce fiber more than an inch long and at the same time very often outyield any of the varieties with shorter staples. Among such varieties are Lone Star, Acala, Columbia, and Durango. The Lone Star has a staple of  $1\frac{1}{8}$  to  $1\frac{1}{2}$  inches under favorable conditions; Acala  $1\frac{1}{8}$  to  $1\frac{3}{8}$ ; and Columbia and Durango  $1\frac{3}{8}$  to  $1\frac{1}{2}$ .

Too little consideration is given to the factor of uniformity, which is the chief industrial and commercial requirement. Fiber of uneven quality will not become favorably known or hold a good standing in the market. A variety of cotton that is to be selected for community production should be uniform in all respects. Some varieties that may attract very favorable attention for other reasons are rendered less desirable by lack of uniformity.

Earliness and productiveness are characters of recognized importance especially under boll-weevil conditions, where the crop must usually be set within a relatively short period. Mistaken ideas of earliness may lead some farmers to plant inferior varieties. By earliness is meant the rapid setting and maturing of a crop, which is not necessarily the same as the very early appearance of the first flowers or first open bolls. It was supposed in former years that it would be necessary to grow inferior, small-bolled varieties under weevil conditions, but some of the big-bolled varieties yield equally well and produce fiber of better quality. Productiveness also depends on resistance to disease or to unfavorable conditions. Large bolls that are stormproof and yet easily picked are also important in saving labor and avoiding the loss of the cotton that, with some varieties, readily falls out of the bolls.

The habits of growth of a variety are important in determining its adaptation to particular requirements, like that of producing a crop in the shortest possible period under boll-weevil conditions. Very short-jointed or cluster varieties are generally undesirable, because they are more liable to excessive shedding and are more difficult to pick. Likewise very long-jointed, open-type kinds should be avoided on account of lateness and poor yielding capacity.

Varieties having a strong central stalk that tends to produce few basal "limbs" or vegetative branches are the best. With plants that stand erect, the cultural operations are easier, and the bolls are held up off the ground. This avoids weather damage and facilitates picking. Spreading or prostrate varieties fill the space between rows or allow the bolls to rest on the ground, where they are more liable to weather damage, as well as more difficult to pick.

A form of plant considered by some breeders as ideal—a plant of low growth with long fruiting branches producing as many bolls as possible near the ground—now appears less desirable than a more upright form of plant with fewer bolls on each branch but more branches producing one or two bolls apiece. A reason why the upright varieties like Acala and Durango are able to produce bolls more rapidly has been found in the fact that the interval between flowers on successive fruiting branches is only about three days, while a period of about six days elapses between successive flowers on the same fruiting branch. In other words, the upward growth of the main stalk is much more rapid than the lateral growth of the branches beyond the first joint.<sup>4</sup>

The variety that is now receiving the most generally favorable attention is the Acala, a relatively new sort, acclimatized a few years ago from Mexico. In addition to being very early and prolific, it is reckoned as an advantage of the Acala that the fiber gets a distinct premium when long staples are in demand and yet is not long enough to be excluded from the short-staple market. Several communities are specializing on the Acala and developing supplies of seed. In the Coachella Valley, an isolated community in California, the growers have organized for an exclusive production of Acala cotton and for developing large stocks of pure seed. In northern Texas

<sup>4</sup> Martin, R. D., Ballard, W. W., and Simpson, D. M. Growth of fruiting parts in cotton plants. *Jour. Agr. Research*, vol. 26, no. 4. Washington, D. C., July 28, 1923.

and Oklahoma several communities have recognized Acala as the best variety to grow, and efforts are being made to eliminate the others.

With varieties that have longer staples than the Acala, special market problems must be faced, on account of great irregularity of commercial conditions. In years when good premiums are paid the long staples may be very profitable, but growers are badly disappointed in other seasons when they can get only slight advances over short-staple prices or at times may be unable to sell when the long-staple market is practically suspended.

If local experiments are to be made as the basis for selecting a variety for community production, the growers should compare not only the behavior of the plants and yields but also the prices obtainable for the different staples. This should be done with the results over a period of years, preferably four or five, not merely for one or two years, which might not cover the range of seasonal or price conditions. The question of staple length should be considered in advance of the discussion of particular varieties, especially in districts that are adapted to the production of superior fiber.

#### **COOPERATION WITH ONE-VARIETY COMMUNITIES TO DEVELOP SUPPLIES OF PURE SEED.**

For several years the Department of Agriculture has cooperated with communities in different parts of the Cotton Belt where efforts were being made to establish supplies of pure seed of superior varieties of cotton, in connection with the breeding and distribution of such varieties by the department. In the course of these cooperations the practical questions of community development have been encountered under varied local conditions that required different precautions. As a result of such experience, an outline statement of the community problems has been drawn for the use of local co-operators, county agents, or extension workers in communities where the one-variety plan is being adopted. This statement shows the needs and requirements for developing pure-seed supplies, in a manner that may serve as a practical summary of the requirements for community production, as treated in this bulletin.

#### **THE NEED OF ONE-VARIETY COMMUNITIES.**

In order to utilize superior varieties of cotton, pure seed must be available for planting to replace the mixed gin-run stocks now generally grown. Failure to provide for the production of adequate supplies of pure seed is responsible for the low and irregular quality of a large part of the American cotton crop. The breeding of superior varieties can have little effect in improving the cotton industry if select, uniform seed stocks are not maintained in sufficient quantities for general planting.

The usual conditions of production, with different kinds of cotton planted in adjacent fields and taken to the same public gins, are not favorable for developing larger supplies of pure seed. Study and experience in the breeding of varieties have shown that the select stocks must be grown in separate communities, apart from other kinds of cotton, if the seed is to be kept pure and selection continued effectively. With such precautions observed, the deterioration now caused

by the mixing of seed at the public gins and the crossing of the varieties in the fields is prevented, and the production of a superior variety can be maintained for many years.

#### COMMUNITY INTEREST IN SEED STOCKS.

Since it usually is not possible to secure enough pure seed to supply a whole community at once, the first problem is to increase the available stocks on some basis that will assure an adequate local supply for the community within a year or two. For this reason it is necessary to recognize a community interest in the stocks that are being increased. Otherwise, individual farmers who plant the increase fields may sell the seed outside of the community or hold it at such a high price that their neighbors refuse to buy, which defeats the purpose of establishing a one-variety community. Such cases have shown the need of guarding the community interest in the seed supply by definite agreements with individual growers regarding the terms of supplying pure seed to the community. Commercial selling of the seed outside of the community should not be considered or recognized as legitimate until a regular and adequate supply for the community is assured.

#### FOUR PRINCIPAL REQUIREMENTS.

Special cooperation has been given by the Department of Agriculture to communities that united upon a single superior variety, in order to establish new centers of production of pure seed. As a basis for such cooperation, four principal requirements are recognized:

(1) A general understanding and agreement by the farmers of a district or neighborhood to limit themselves to the production of a single superior variety of cotton.

(2) Precautions against mixing of varieties, including the isolation of the seed-increase fields and facilities for separate ginning.

(3) Participation of local representatives in breeding and selection work, so that the community leaders and others may become familiar with the methods and precautions that are necessary to maintain the purity and uniformity of seed stocks or to develop select strains adapted to the local conditions.

(4) Handling and supplying select seed to the community under some arrangement that will make it possible for all of the local farmers to be provided with pure seed as rapidly as possible and for pure seed to be furnished to other communities at reasonable prices.

#### AGREEMENT UPON A SINGLE VARIETY OF COTTON.

Since organized effort is required to establish one-variety communities and develop seed-supply centers, the prospects are better if the community plan is adopted by a responsible association of the farmers of a district or neighborhood who agree to plant only the one variety of cotton and to continue with that variety until some other sort has been found superior after careful comparative tests, so that the community decides to change as a unit. If only a limited organization can be formed at first, the members should agree to promote, in so far as they are able, a general organization of all the local cotton growers, so that adequate supplies of good seed may be established and utilized by the whole community.

## PRECAUTIONS AGAINST MIXING OF SEED.

Until a community is established in the production of a single variety, special precautions must be taken to prevent crossing with other varieties in the field and the mixing of seed at public gins. Since the neglect of any single precaution may nullify all the others, the handling of stocks of pure seed should be intrusted only to careful, responsible representatives of the community. The principal precautions are as follows:

*Planting on clean land.*—Planting of all breeding blocks and increase fields must be on clean land where no cotton was planted the preceding year and where there were no volunteer or hold-over plants.

*Isolation of seed fields.*—Fields where planting seed is grown should be isolated from any other varieties or mixed stocks by at least half a mile.

*Inspection of wagons and picking sacks.*—A careful inspection must be made of all picking bags and wagons used in handling cotton from the seed-increase fields, to see that no other seed cotton is mixed with the special stocks.

*Prompt picking of select seed.*—To reduce the danger of loss or injury from bad weather, select seed should not be left in the field to the end of the season, but should be picked with reasonable promptness after the bolls open.

*Separate ginning.*—Facilities for separate ginning must be available for any large-scale production of pure seed. Until separate ginning is provided, special precautions are necessary and must be carefully supervised. All of the gin apparatus must be thoroughly cleaned of seed, including the pneumatic suction pipe, the overhead cleaner or beater, the gin-stand conveyor belt, and the gin stand. Seed must not be run through the screw or other automatic conveyor, but must be caught on the floor in front of the gin stand and sacked at once in bags that are known to be free from any other cotton seed. Precautions in ginning are a necessary feature of any certification of pure seed by State authorities, as in California, Arizona, and Texas, which is greatly facilitated by community organization of growers.

*Storing of seed.*—All of the select stocks of seed should be labeled, stored, and handled by responsible representatives of the association, to avoid danger of mixture with other stored seed or of weather damage, fire, or other accidents.

## PARTICIPATION OF LOCAL COTTON BREEDERS.

Communities should designate their most proficient and best-qualified members to take part with the agents of the Department of Agriculture in breeding, roguing, and inspection of seed stocks. The work of roguing the seed-increase fields to remove abnormal plants, selecting the best individuals for progenies, as well as planting, raising, and comparing the progenies, should be taken over as rapidly as possible by the local community representatives.

## SUPPLYING PURE SEED TO THE COMMUNITY.

Unless a local association undertakes the direct handling of the stocks of pure seed, binding agreements should be made with individual growers to the end that all members of the association and other farmers in the community may be fully supplied with pure seed at moderate prices. Experience has shown the need of provisions to guard the interests of the community and of the Department of Agriculture in the selected and rogued seed stocks and to make them available elsewhere if not required for local use.

The seed from the rogued increase fields should be available to the community at oil-mill prices plus handling costs. Any surplus of rogued seed not required by the community should be utilized to the best advantage, not by being sold in small lots at high prices but by being placed in another community where such seed is likely to be appreciated and the cultivation of the variety established.

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NOTE.—More detailed information on one-variety cotton communities is given in Bulletin No. 1111 of the Department of Agriculture, *One-Variety Cotton Communities*, which also contains a list of publications on community cotton improvement.

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